services, upon which they relied in investing substantial resources and effort in developing their AVM systems. Given the intolerable inequity of this result, the Commission should not entertain further its exclusivity proposal.

Inherent in the *Ashbacker* decision, is the recognition that the Commission cannot afford opportunities to provide radio services to certain parties in a manner that would "in midstream" deny preexisting opportunities of other parties to provide the same radio services. Because such a "retroactive change confounds the expectations upon which persons acted,"[112] it risks a level of unfairness that violates both well-recognized limits on agency rulemaking power[113] and standards of fairness.

Based on the shared spectrum environment in which AVM licensing has long been conducted, Pinpoint has invested several years of intensive research and development as well as almost 5 million dollars to develop its wide area AVM system. Substantial investment has also been made by other AVM service providers. This investment was predicated on the assumed continuation of the current shared spectrum environment, an assumption that was reasonable given the Commission's long-standing rules. It is also on this basis that Pinpoint and others did not contest or challenge the hundreds of applications PacTel and MobileVision have filed to provide AVM in

---

[112] *Hastings v. Earth Satellite Corp.*, 628 F.2d 85, 93 (D.C. Cir.), *cert. denied*, 449 U.S. 905 (1980).

[113] *See Greene v. United States*, 376 U.S. 149, 160-161 (1964) (rule cannot retroactively interfere with pre-existing rights); *Yakima Valley Cablevision, Inc. v. FCC*, 794 F.2d 737, 746 (D.C. Cir. 1986) (voiding FCC's retroactive application of cable rules); *Saint Francis Memorial Hosp. v. Weinberger*, 413 F. Supp. 323, 332 (N.D. Cal. 1975) ("Retrospective application of statutes and regulations is frowned upon where the application of such changes in the law works to deprive a party of an antecedent right.").

markets across the country. Under the current flexible, open-door licensing framework that existed when these applications were filed, there would have been little reason to file "competing applications" because mutually exclusivity was not, and had never been, recognized in the shared spectrum environment of 902-928 MHz. Clearly, Pinpoint and other existing and future wide-area system applicants had no reason to anticipate the Commission's proposed conversion of the licensing process from the current open entry model to that of exclusivity. For the Commission to impose exclusive licensing now would be like slamming the door in the face of invited guests, after allowing a steady flow of early arrivals in. Because such action would be totally inequitable and would violate standards of fairness inherently recognized in *Ashbacker*, the Commission cannot lawfully and equitably adopt its exclusivity proposal.

It is wholly obvious that PacTel, who filed for licenses for one of the two 8 MHz bands in the top 50 urban markets, but has extended its construction requirements significantly, has sought to obtain exclusivity so that it can lock-up dozens of markets unfairly. In contrast, Pinpoint has only filed applications to date for the number of systems that it is prepared to operate initially. So long as the spectrum sought by PacTel was shared, Pinpoint and others were not prejudiced by PacTel's prolific AVM application filing, and were not disserved by their own measured and judicious approach to filing applications for AVM. If the Commission affords exclusivity to PacTel, however, it will sanction PacTel's speculative tendencies and punish Pinpoint

for its more prudent approach, which the Commission should encourage in the interests of efficient and equitable use of radio spectrum.

Given the overarching principles of fairness implicated by a grant of exclusivity to the existing licensees, the Commission must, if it declines to implement sharing for wide-area multilateration systems and insists upon exclusivity, only afford exclusivity after it has provided an opportunity for all interested, qualified applicants to seek licenses. The Commission could achieve this by opening windows for the filing of applications in markets where existing licenses have been granted for the operation of wide-area AVM systems. While this approach would abrogate the numerous public interest benefits of spectrum sharing discussed above, it is the only method by which the Commission could implement exclusivity and meet the legal requirements and underlying policy concerns of the *Ashbacker* decision.

IV. WIDE-AREA AVM SYSTEMS SHOULD BE PERMITTED TO OPERATE THROUGHOUT THE ENTIRE BAND ON A SHARED BASIS WITH LOCAL-AREA SYSTEMS

In addition to demonstrating in its comments that the Commission correctly concluded in the *NPRM* that sharing among wide-area systems is both feasible and in the public interest, Pinpoint explained further that the public interest would be served if the entire 902-928 MHz band were made available for licensing to wide-area operations on a shared basis. The underlying basis for that conclusion is, first, as described above, the capacity of wide-area systems rises exponentially as the bandwidth increases

and, second, the co-existence of local-area and wide-area systems in the same spectrum is not inimical to high-quality wide-area service. The comments submitted in response to the *NPRM* support these views.

A. The Commission Should Make the Entire Band Available to Wide-Area Systems Because the Throughput Capacity of Wide-Area Systems Is Exponentially Related to Bandwidth

Pinpoint demonstrated in its comments that the capacity of a wide-area operation is related to up to the cube in the increase in bandwidth. Accordingly, an increase in bandwidth from 4 MHz to 16 MHz, for example, would mean over a fifty-fold increase in capacity.

The comments of PacTel support this finding, despite the fact that they erroneously suggest that the relationship between the changes in bandwidth and throughput is exponential only to a factor of two, and not three.[114] PacTel's result understates the beneficial effects of increased bandwidth because, as Pinpoint noted in its opening comments, PacTel used the derivation for the gaussian-white-noise case only, whereas in the 902-928 MHz band it may be limited by narrowband noise.[115] The fact remains, however, that an exponential increase in capacity only underscores the wisdom in sharing through time-division, as that is the only method by which multiple firms will be able to exploit the exponential increase associated with larger

---

[114] PacTel Comments at 23. MobileVision likewise recognizes to increase in capacity as bandwidth increases. MobileVision, tech. app. at 31.

[115] Pinpoint Technical Appendix.

bandwidths.[116] Moreover, such capacity is needed to facilitate sharing consistently with the demands for high capacity applications, such as those associated with IVHS. Accordingly, the Commission should make the entire 26 MHz of the band at issue in this proceeding available for licensing to wide-area systems on a shared basis.

B. Sharing Between Wide-Area and Local-Area AVM Systems Is Consistent with the Provision of High-Quality Wide-Area Service

Pinpoint, alone among the wide-area AVM technology developers filing comments in this proceeding, acknowledges the ability of wide-area systems to share the band with local-area systems. Through the judicious placement of base station sites, the use of higher powers by both bases and mobile, the retransmission of position-fixing pulses by mobiles, and filtering of local-area signals, the adverse effects of co-channel local-area systems can be minimized.[117]

---

[116] Southwestern Bell proposes that the FCC create four 4 MHz sub-allocations for exclusive wide-area licensing. While this frequency division multiple-access approach reflects an appreciation that the public interest is best served by more open entry and greater competition, it will result in a markedly inferior choice, in terms of throughput capacity and less competition, than TDMA sharing over a larger bandwidth. Ironically, PacTel and MobileVision, both of which require only 4 MHz of spectrum to deploy their systems, question the sufficiency of 4 MHz assignments. *See* PacTel Comments at 23; MobileVision Comments at 36. While they are correct, neither of them has taken advantage of the bandwidths which each has been assigned.

[117] As Exhibit C to its comments, Pinpoint provided an analysis of how the placement of base station transmitters relative to a local-area station, and their power levels, affected the size of the area surrounding a local-area system where there was a significant potential for harmful interference. As a complement to that study, the Technical Appendix shows how mobile transmitter power levels and the placement of base stations relative to a local-area station could work to alleviate the effects of interference on the mobile-to-base links that can have negative effects on the position fixing functions of AVM systems.

PacTel, MobileVision, and Southwestern Bell assert the inability of wide-area and local-area systems to share. By and large, these commenters take comfort principally in the *NPRM*'s preliminary observations that such sharing may be difficult. However, their comments themselves do not substantiate the *NPRM*'s statements; rather they identify the existence of the problem and, at bottom, assume the absence of solutions.

PacTel, in fact, describes many of the same solutions as Pinpoint, but fails to acknowledge the fact.[118] Specifically, the commissioned study attached to PacTel's comments, prepared by Dr. Pickholtz, poses the scenario of how an established wide-area system might act to counter the introduction of a second wide-area system.[119] Pinpoint notes, as PacTel does not, that these steps could even more effectively be taken by a wide-area system in reponse to a local-area system located in the same market.[120]

PacTel notes that a second wide-area system is likely to react to these steps with identical counter-measures. While this may be true, Pinpoint submits that a local-area system, because it is much less susceptible to interference than wide-area technologies, would not respond in kind. Moreover, because wide-area systems would be operating

---

[118] Actually, PacTel makes one footnote reference on the applicability of its discussion to wide-area system sharing to the co-existence of wide-area and local-area systems, which in PacTel's parlance it calls "narrowband." See PacTel Comments at 28 n.32 (Pickholtz study applies to narrowband systems as well as wide-area HML systems).

[119] Pickholtz at 35-43.

[120] More realistically, the wide-area system would undertake some of these steps, such as increased power and wider bandwidth, even before being faced with a local-area system in the market.

on a TDMA basis, under Pinpoint's plan, these measures would not increase the interference potential to other wide-area systems. Thus, because there would be no escalation, the steps taken by a wide-area system would be permanently effective.

Accordingly, PacTel has noted the following measures as being effective in responding to a local-area system in the same market:

* Higher power pulses;[121]
* Additional bandwidth;[122]
* Filtering;[123]
* Directional antennas;[124] and
* Additional base stations.[125]

---

[121] Pickholtz at 35. Because Pinpoint poses a wider bandwidth, the pulse duration could be significantly short so as to make any per mobile unit costs increases marginal. Moreover, Pinpoint notes that PacTel's claims about the cost of mobile unit replacement are not material since PacTel has operations in only a few cities, in none of which, Pinpoint understands, is PacTel sharing frequencies with any local-area systems. Thus, replacement could occur gradually and over a reasonable transition period.

[122] *Id.* at 37-38. Under Pinpoint's band plan, unlike that supported by PacTel, such bandwidth would be available, overcoming one of PacTel's principal objections, that the bandwidth is unavailable. Professor Pickholtz's discussions about the amount of bandwidth needed to make a material difference assumes interference from a co-channel wideband system base station, not a more benign low power local-area base station.

[123] *Id.* at 39. Of course, PacTel had already noted that narrowband systems could be effectively filtered.

[124] *Id.* at 39-40.

[125] *Id.* at 42. In possibly silent acknowledgement that the addition of one or two additional base stations near a low-power local-area system could be particularly effective, as Pinpoint demonstrated in Appendix C to its comments, Professor Pickholtz notes that *"[t]he least harmful type of interference involves a low-power interfering transmission from a transmitter on the ground and placed close to a pulse-ranging system's base station."* *Id.* at 11. Accordingly, it should be particularly effective to "bring the base station" to the local-area system.

These methods discussed by PacTel, particularly in combination, provide an entire battery of permanent, effective methods that could be used to counter potential interference from local-area systems.

In a study attached to its comments, PacTel illustrated the feasibility of sharing among wide-area and local-area AVM systems from actual field results.[126] Ostensibly designed to show that uncoordinated simultaneous co-channel operation of two wideband systems would result in intolerable interference, the PacTel study actually shows how power management and the judicious placement of receive sites can facilitate the use of the same band by wide-area systems and local-area systems.[127]

In conducting this experiment, PacTel established a wideband interferer atop its 100 foot high building near the center of its Dallas-Fort Worth coverage area. The interferer was to simulate a wideband wide-area system forward link. It was centered at 908 MHz, the same frequency employed by PacTel for the center of its current 4 MHz wide system. The interferer operated with a maximum ERP of 38.9 watts.[128]

PacTel then determined how many sites out of a maximum possible number of "14 to 16" could receive the signal of its mobile unit. The tests were carried out with

---

[126] PacTel Comments, app. 2 (Theoretical and Field Performance of Radiolocation Systems, June 25, 1993).

[127] Contrary to the straw man argument against which PacTel has devoted substantial resources, Pinpoint has not proposed simultaneous uncoordinated co-channel sharing. Instead, Pinpoint has advocated time division multiple access as a means for sharing the spectrum among wide-area licenses. Local area systems would not be operated on a TDMA basis with wide-area systems, but would be restricted to substantially less power than wide-area systems.

[128] *Id.* at 10-13. The PacTel mobile unit transmitted at -0.5 dBW into an antenna with 0 dBi gain antenna for an ERP of about 890 mW.

Unlike both hearings and lotteries, however, the retroactive effect of the Commission's proposal would result in the arbitrary selection of PacTel and MobileVision as the providers of AVM/LMS best suited to serve the demands of the marketplace and, ultimately, the public.

But, as discussed above, the *de facto* duopoly that would result from exclusivity would not best serve the public interest, as it would suppress competition, stifle innovation, increase the costs of services, and reduce consumer choice.[106] Reserving the field to only PacTel and MobileVision would also abrogate the public interest by frustrating important national transportation policies in support of intelligent vehicle-highway systems, and make the public captive to the extended and unpredictable construction schedules for deployment of PacTel's and MobileVision's AVM/LMS systems.[107]

These concerns are not theoretical, but both timely and real. PacTel has only deployed its system in six cities, using 4 MHz of spectrum, an amount that it has admitted makes its systems "useless."[108] MobileVision has deployed no commercial systems, despite bullish language in its comments, which is surprising in the wake of

---

[106] *See* Section II, *supra*.

[107] S. Rep. No. 105, 103d Cong., 1st Sess. 39 (1993). The Committee stated that final rules in Docket 93-61 must be "consistent with the policies and goals of the Intelligent Vehicle Highway Systems Act of 1991 [and] promote the development and implementation of intelligent vehicle highway systems."

[108] PacTel Comments at 24.

the interferer operating at effective radiated powers ranging from 62 mW to 38.9 watts. The average number of receive sites capable of detecting the presence of a pulse from the mobile were then tabulated and presented in Table 2 of the report and displayed graphically in Figure 9 of PacTel's Appendix 2. Figure 9 is reproduced below.

The data summarized above show that only five sites could receive the PacTel mobile's wideband pulse when the interferer was operating at 1 watt. According to PacTel, at least four sites must receive the signal "to guarantee an unambiguous location estimate. In practice, an operating pulse-ranging system would probably use more than four receive sites to improve the quality of the location estimates and to improve reliability."[129] Significantly, Pinpoint has proposed an alternative under which there would be quiet sub-bands at 906 - 910 MHz and 920 - 924 MHz to accommodate wide-area systems, such as PacTel's, that are using only 4 MHz.[130] At 907 - 909 and at 921 - 923 MHz, local area systems would be restricted to an ERP of 50 milliwatts and height of no more than approximately 30 feet above ground.[131]

PacTel's Figure 9 shows no apparent interference at 50 milliwatts on a theoretical basis and that empirically, 12 to 14 sites were receiving the signal when the interferer operated at 62 milliwatts. Elsewhere in the sub-band, tag readers would operate at no more than 200 milliwatts ERP under Pinpoint's proposal. When the

---

[129] Pickholtz at 6.

[130] *See* app. A.

[131] Pinpoint Comments at 34.

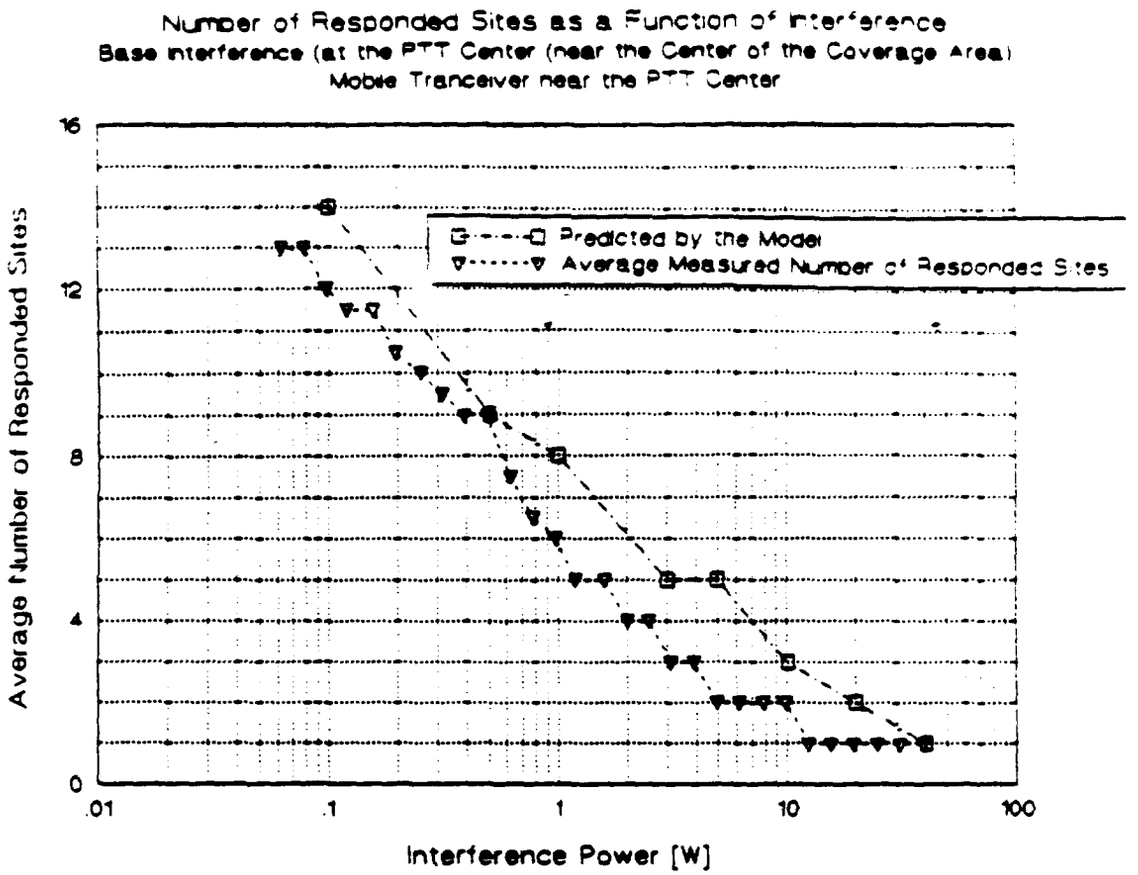


Figure 9

Figure 9 plots the average number of sites detecting a pulse as a function of the interference power. It also plots the model's prediction of the number of sites that would detect a pulse. The predicted and measured performance agree closely. The model predictions tend to be about 3 dB more optimistic than the actual field measurements.

interferer operated at 200 milliwatts, 10 sites were able to receive the mobile's signal. Notably, an interferer at 100 feet would have a "height gain" of about 10 dB toward many sites as compared with an antenna height of 30 feet.[132] Thus, the effect of the interferer operating at 100 feet would be much greater than if it were operating at 30 feet.

The same experiment also shows that the PacTel system could improve its performance significantly vis-a-vis local-area signals if the power of the PacTel mobile units was closer to the 50 watts for which the units were licensed. Figure 9 from the study illustrates that a 10 dB decrease in the relative power of the interfering signal (operating at 100 feet) will yield a dramatic improvement in the number of usable receive sites (e.g. from 5 sites at 1 watt to 11 sites at 100 mw.) The same degree of improvement should be achievable by a 10 dB increase in the transmit power of the mobile unit. Thus, local-area base stations that employ modest power levels should be

---

[132] PacTel's mobiles are licensed to operate with 50 watts transmitter output and an ERP of 158 watts. With an antenna of 0 dB gain, this would yield 50 watts ERP or 17.4 dB more power than PacTel now claims to be using. Even with a - 6 dB gain antenna, 50 watts output would yield an ERP of about 12 watts or some 11 dB more than PacTel currently employs. The interferer in the PacTel experiment was atop a 100 foot high roof. Thus, the interferer likely possessed a significant "height gain" with respect to many sites over that which would obtain at 30 feet. This would be approximately 10 dB. *See* IEEE Transactions on Vehicular Technology, Special Issue on Mobile Radio Propagation, *Coverage Prediction for Mobile Radio Systems operating in the 800-900 MHz Frequency Range*, 16, 20-22 (Feb. 1988) (6 dB gain for every doubling of height; 20 dB log h for height gain; for example, 20 log 100 feet - 20 log 30 feet = 10.5 dB). Pinpoint has proposed that most local-area systems not be allowed to operate with more than 30 watts at 10 meters above ground. Hughes would reduce the power accordingly if the height above ground exceeded 10 meters.

compatible with those wide-area systems that are engineered to operate in a relatively noisy shared band.[133]

MobileVision, too, presents evidence that sharing is feasible. For example, MobileVision notes the use of retransmissions by mobile units. Contrary to MobileVision's suggestion, such a feature need not reduce system capability appreciably if other methods, as suggested by Pinpoint and PacTel, are taken to minimize the size of "black out" areas that would trigger the need for retransmissions.[134]

At bottom, therefore, co-existence based upon mutual cooperation and effort by wide-area and local-area systems is feasible. Because the public interest would benefit from the widest possible bandwidth being available for wide-area systems, the FCC should allocate the 902-928 MHz band for licensing on a sharing basis to both wide-area and local-area systems.

---

[133] Pinpoint has conducted measurements on the local-area system that uses AMTECH technology to collect tolls on the Dallas North Tollway. The tag readers there were operating with about 7 watts ERP employing very high gain directional antennas canted downward toward the tags on cars. At about one-half mile away, however, the signals from the tag readers were sufficiently scattered by cars and the road so as to be consistent with a transmitted power of less than about a watt. Thus, the gain of the directional antenna was not adding to the interference at this distance.

[134] Pinpoint questions MobileVision's commitment to install a system architecture consistent with robust operation. As an illustration, MobileVision suggests that a typical distance between mobile units and receive sites will be 10 to 12 miles. MobileVision Comments at 21 n.16. If that is the case, MobileVision is intending to separate base stations by 20 to 24 miles on average or concentrate them at a single central location in a market.

V. WIND PROFILERS SHOULD NOT BE ALLOWED TO DEVELOP "IN PARALLEL" WITH AVM AND LMS

In this proceeding, the Commission has proposed to allocate the 902-928 MHz band to AVM. By doing so, the FCC will usher in a new age in vehicle location services and mobile resources management. One commenter, Radian Corporation ("Radian") seeking to expand the scope of this proceeding -- and to overcome its frustrations in another docket -- requests the FCC to jeopardize the future growth and enhancement, not to mention the important public benefits, of AVM.[135] Radian asks the FCC in this proceeding to allow AVM and commercial wind profiling to proceed in the 902-928 MHz band side-by-side.[136]

The Commission should not allow commercial wind-profiler systems to delay or otherwise hinder the full deployment of AVM systems and technologies. As developed fully in Docket 93-59, Radian's contemplated operations would present a serious interference threat to many AVM systems, particularly broadband wide-area operations.[137] One of the chief and consistent complaints in that proceeding was that

---

[135] Specifically, Radio Corporation ("Radian") recently failed to persuade the Commission to adopt a Notice of Proposed Rulemaking proposing the allocation of spectrum for wind profiler radar systems at 915 MHz. On March 10, 1993, the FCC adopted a notice of inquiry to examine the nature of end prospects for wind profiler operations at 915 MHz.

[136] Comments of Radian Corp., PR Docket No. 93-61 at 16 (filed June 29, 1993).

[137] Comments of Pinpoint Communications, Inc., ET Docket No. 93-59 at 5 (filed June 15, 1993) ("Pinpoint Wind Profiler Comments"); Reply Comments of Mark IV, ET Docket No. 93-59 at 1-2 (filed July 15, 1993); Reply Comments of North American Teletrac and Location Technologies, ET Docket No. 93-59 at 2-3 (filed July 15, 1993) ("PacTel Wind Profiler Reply Comments"); Reply Comments of Hughes Aircraft Company, ET Docket No. 93-59 at 4-5 (filed July 15, 1993).

Radian failed to provide sufficient information to permit a full analysis of the interference potential wind profiler systems pose. At the same time, the commenters noted that the limited data proffered by Radian made clear the danger.[138]

While Radian supplied some additional description of its proposed wind profiler radar systems in its reply comments in Docket 93-59, Pinpoint notes that the potential for wind profilers to wreak havoc has merely been confirmed. Namely, the exceptionally high antenna gain of Radian's 500 watt, high-frequency-pulse[139] transmitters will produce approximately 15 watts of energy in the horizontal direction (up to a 5° elevation), even with fences providing -45 dB suppression of sidelobes relative to peak.[140] Thus, it is likely that wind profiler operations, even with minimal spreading through the use of longer pulses, would seriously limit the ability of wide-area AVM systems to spread over large parts of the 902-928 MHz band, with significant costs in terms of lower capacity.[141]

---

[138] *See, e.g.*, Pinpoint Wind Profiler Comments at 4; Pactel Wind Profiler Reply Comments at 2; *see also* Comments of AMTECH, RM-8092 (Nov. 2, 1992).

[139] Radian indicates a pulse repetition rate of 100 to 50,000 times per second.

[140] Reply Comments of Radian Corp., ET Docket No. 93-59, exh. A. Of course, this level of suppression assumes the fences will operate up to specification, not a foregone conclusion in a service to be predominated with portable units.

[141] Wind profilers present a far more serious interference threat to wide-area AVM systems than do local-area AVM systems. The transmitters on local-area systems are operating typically at ERPs under 10 watts, and generally are canted downward, meaning that the effective radiation toward the horizon is much less. Wind profiler signals are directed upward. Moreover, most existing local-area systems employ a narrow carrier to illuminate a tab that then modulates the reflected signal to create a wide-band, very low level signal. Such installations are typically at fixed locations. In contrast, wind profilers would be broadband and characteristically portable, preempting some effective and permanent countermeasures. Moreover, unlike portable tag readers that might, for example, be used by police, the

(continued...)

Given the important public advantages flowing from AVM systems, both wide-area and local-area, it is important that sufficient spectrum be allocated to permit achievement of those benefits. As the Senate Appropriations Committee recently stated, it is important that the FCC adopt

> [a]utomatic vehicle monitoring and automatic vehicle identification rules that, consistent with the policies and goals of the Intelligent Vehicle Highway Systems Act of 1991, would promote the development and implementation of intelligent vehicle highway systems by providing access to essential electronic spectrum and enable public entities to install IVHS as part of their transportation infrastructure.[142]

Attending the more efficient management of mobile resources accompanying the deployment of advanced IVHS systems are important environmental benefits. Namely, effective IVHS will lead to significant reductions in gasoline consumption and alleviation of air pollution.

Radian does not present a strong case for the need for commercial wind profilers. No non-governmental entity has supported Radian's proposed allocation, and the federal government can and does already conduct wind profiling operations at 915 MHz.[143] Further, the primary uses targeted by Radian are weather-forecasting and

---

[141](...continued)
duty cycle of a portable wind profiler will likely consist of a continuous series of pulses. As such, portable wind profilers would pose an added threat of interferences.

[142] S. Rep. No. 105, 103d Cong., 1st Sess. 2 (1993).

[143] Comments of National Oceanic and Atmospheric Admin., ET Docket No. 93-59 at 7-8 (filed July 15, 1993).

environmental air quality studies. Weather-forecasting involves primarily high-altitude applications which are better performed at 449 MHz,[144] which the FCC has already proposed to allocate to wind profilers.[145] Concerning the measurement of air quality, federal environmental agencies can use the governmental radiolocation allocation at 915 MHz, and there is no showing of demand for this use on a non-governmental basis.[146]

Further, Pinpoint notes that the incremental environmental benefit of adding another method of air-quality measurement pales besides the potential benefits of high-capacity IVHS. Therefore, the FCC should not allow Radian's proposal to slow the implementation of AVM systems throughout the 902-928 MHz band. Rather, the Commission should continue to study the compatibility of wind profiler systems in ET Docket No. 93-59, and determine what action, if any, is appropriate in response to Radian's request only after final AVM rules are adopted.

---

[144] *Id.* at 6.

[145] *Spectrum for Wind Profiler Radar Systems*, 8 F.C.C. Rcd 2546, 2546 (1993) (Notice of Proposed Rule Making and Notice of Inquiry).

[146] Pinpoint notes that there is a significant amount of radio spectrum in the 1200 MHz band allocated to radiolocation which might be suitable for air quality monitoring. 47 C.F.R. § 2.106. *See also* Comments of the American Meteorological Society, ET Docket No. 93-59 (July 15, 1993) (900-1300 MHz considered a single band for wind profiling operations).

VI. THE STATUS OF AND REGULATIONS GOVERNING PART 15 AND AMATEUR OPERATIONS SHOULD NOT CHANGE

Two groups of commenters representing the manufacturers of devices regulated by Part 15 of the FCC's rules -- and the related user community -- and amateur radio operators question the need for opening the entire 902-928 MHz band for AVM purposes. Pinpoint has demonstrated in its comments, and in the above discussion, the numerous important public interest benefits flowing from making the entire 26 MHz band available for AVM systems. Chief among them is the fact that maximizing the available bandwidth prepares the way for genuine competition in the provision of high-capacity wide-area AVM services and deployment of IVHS. Without such an expansion in the spectrum, it is a virtual certainty that the throughput necessary to achieve mature intelligent vehicle highway systems cannot be achieved. As the 902-928 MHz band is the ideal home for wide-area IVHS, regulations foreclosing adequate spectrum will squander an ideal, even unique, opportunity and set back the prospects for achieving important national transportation policies for many years.

A review of the record reveals that the calls by the amateur and Part 15 communities for the *status quo ante* or a more limited expansion of AVM into the 902-928 MHz band than proposed in the *NPRM* are borne of the fear that the less robust systems of some AVM operators, such as PacTel and MobileVision, will not be able to tolerate these secondary operations. Pinpoint recognizes their concern, but notes that under the AVM sharing scheme Pinpoint proposed in its comments,

wide-area systems will need to be robust enough to tolerate co-channel interference from co-primary local-area operations. Thus, wide-area system developers will need to engineer-in a robustness that should also permit them to tolerate the use of Part 15 devices.

As explained in the attached Technical Appendix, the Pinpoint system possesses this requisite degree of robustness. Conversely, Pinpoint's contemplated operations will not preclude use of Part 15 devices. Pinpoint does not believe it will cause undue interference to secondary amateur operations.[147]

In sum, the Commission need not and should not consider restricting the current access of users that are secondary to AVM to the 902-928 MHz band. Similarly, the FCC need not modify the technical regulations under which Part 15 devices and the amateur radio community operate.

VII. CONCLUSION

For the foregoing reasons, the Commission should allocate the entire 902-928 MHz band to AVM systems. Further, the final rules should provide for shared use of the whole band by all AVM system types. Finally, the FCC should expeditiously open

---

[147] *See* Technical Appendix.

filing windows for wide-area AVM system applications in order to usher in the competitive provision of high-capacity IVHS and other AVM/LMS services.

Respectfully submitted,

PINPOINT COMMUNICATIONS, INC.

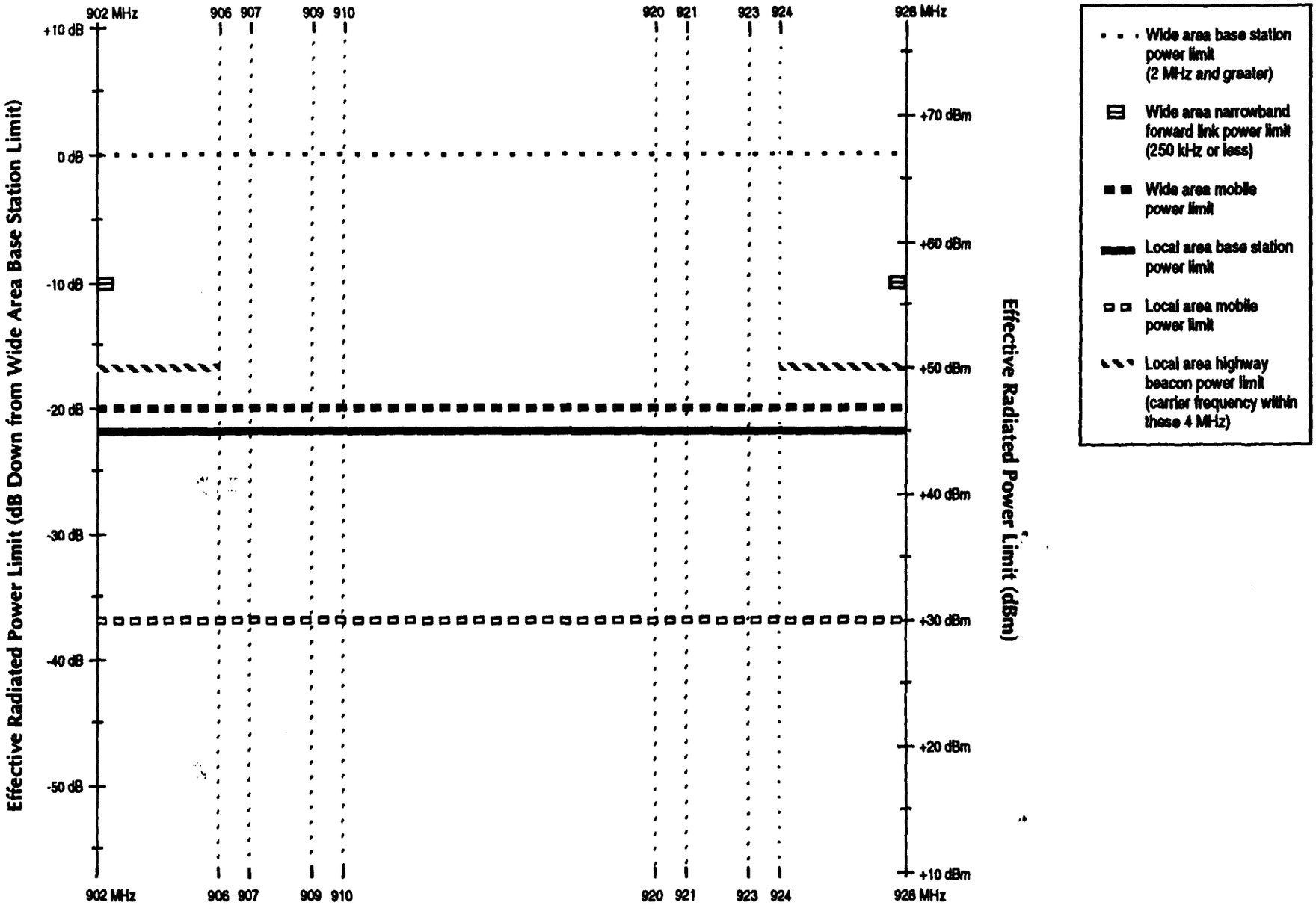
\s\ Edward A. Yorkgitis, Jr.
John L. Bartlett
David E. Hilliard
Carl R. Frank
Edward A. Yorkgitis, Jr.
Aliza F. Katz
WILEY, REIN & FIELDING
1776 K Street, N.W.
Washington, D.C. 20006
(202) 429-7000

Its Attorneys

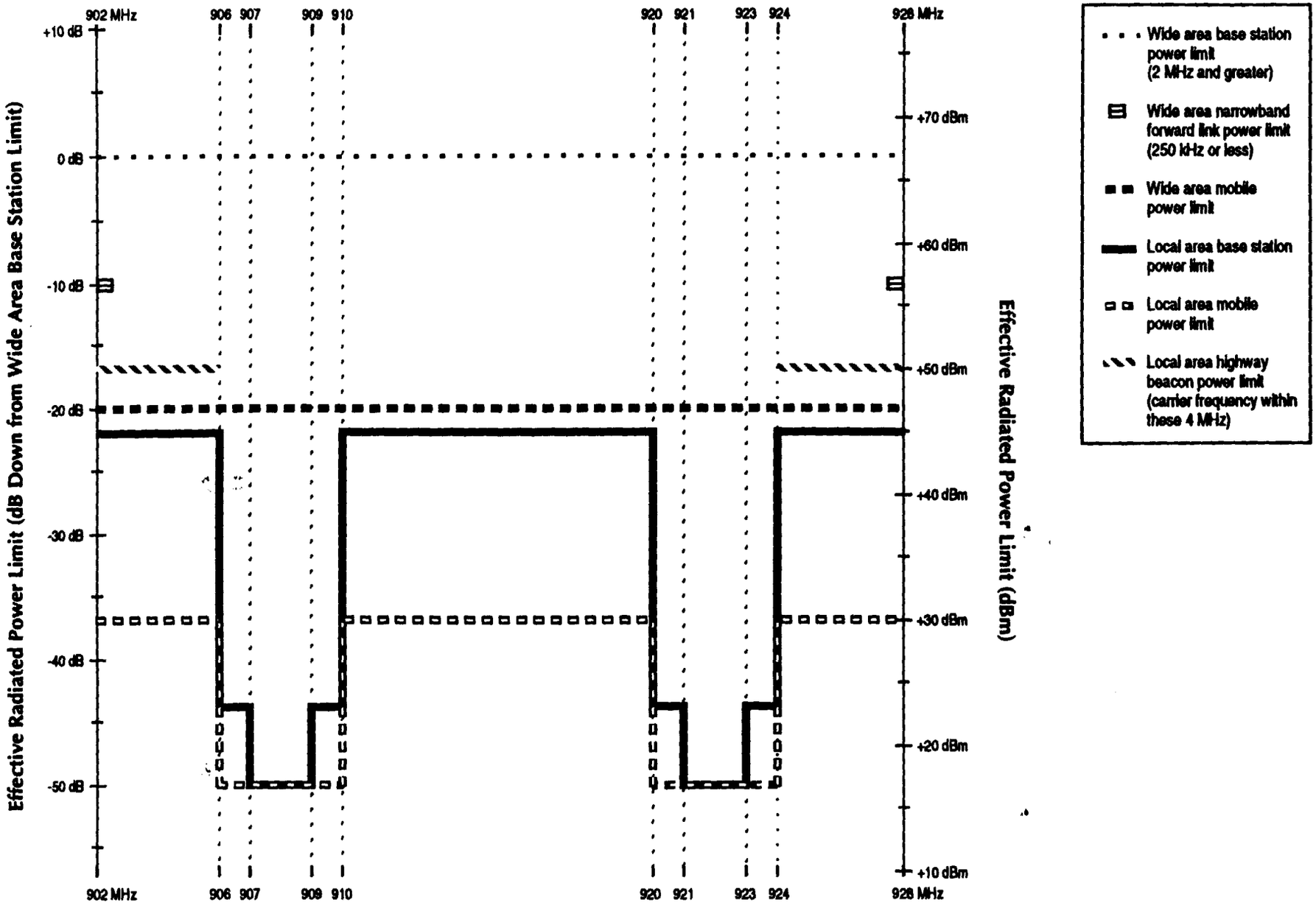
July 29, 1993
(Corrected August 3, 1993)

APPENDIX A

PINPOINT BAND PLANS



Proposed Power Limits for LMS Systems in the 902-928 MHz Band (Preferred Plan)



Proposed Power Limits for LMS Systems in the 902-928 MHz Band (Alternative Plan)

Appendix B

TECHNICAL APPENDIX

Response to Comments Filed in PR Docket No. 93-61 Concerning the Adoption of Final Regulations Governing Automatic Vehicle Monitoring

Prepared by Louis H.M. Jandrell
Vice President of Design and Development
Pinpoint Communications, Inc.

Pinpoint Communications, Inc. ("Pinpoint"), an innovator in automatic vehicle monitoring ("AVM") technology, stands out among wide-area AVM technology proponents filing comments in this proceeding in several respects: Pinpoint is the only developer of a system, ARRAY™, with sufficient capacity to serve multiple intelligent-vehicle highway systems ("IVHS") applications in large metropolitan areas. Pinpoint is the only developer to describe a realistic method for sharing among co-channel wide-area systems. Pinpoint is also the only wide-area system proponent to propose a well-designed wide-area AVM system that will successfully co-exist with local area systems and other users of the 902-928 MHz band in the same spectrum.

It is with these distinctions in mind that the following responses are offered on the initial comments filed in the Commission's PR Docket No. 93-61:

A. Why ARRAY™ is the Only Current Technology Capable of Handling the Radiolocation and Messaging Needs of IVHS

The most current statistical vehicular traffic information relating to the radiolocation and messaging needs of IVHS demonstrate the need for capacity well in excess of that offered

by any current location and/or messaging system or combination of the two. Data put together by a vehicular technologist working in the IVHS area are summarized in the attached tables.[1] They are based on composite demographic data from five cities of approximately two million in population.

The actual city-specific demographic data are summarized in Table 1, and the projected vehicular traffic data, in Table 2. Pinpoint has used this as the basis for making estimates of both the radiolocation and message traffic requirements of early (*i.e.* currently described) IVHS traffic monitoring and traveler information programs. The projections do not address the additional capacity that may be needed for more mature programs such as individual vehicle traffic control (for such purposes as optimal traffic routing). Tables 3 and 4 summarize the model and network capacity estimates required for traffic monitoring and traveler information systems, respectively, based upon the information provided in Tables 1 and 2.

Table 3 shows that only modest market penetration (2.5% to 5% of vehicle population) is required in order for IVHS applications to yield significant returns to the IVHS system users in terms of real time information on traffic conditions.

---

[1] The data are taken from a summary of a report prepared by the Mitre Corporation for the Federal Highway Administration entitled "Communication, Storage and Processing Load Requirements of Alternative IVHS Architectures," by Cheslow, Hatcher and Hsin, presented at the IVHS America meeting in April 1992, and made available recently at the TransTech Conference, Seattle, July, 1993.